

is, and growing as is the need for economy. . . . The University Colleges during fifteen years have proved their value; and also, like every other educational institution, they have proved that they cannot live without external help. The only help that is likely to be permanent and that will enable them to feel secure is help from the State; and, in a moderate degree, it will be worth the State's while to give it."

The opinions of men of science on the subject were expressed in a letter from Sir Henry Roscoe, which appeared in the *Times* on Saturday last. "It is unnecessary now," he wrote, "to enlarge on the important national work in which these colleges are engaged. That the higher scientific and technical training which these colleges are now giving to the best of their power is a necessity, indorsed as this opinion has been by two Royal Commissions, is now, I am glad to think, generally admitted. It is, however, perfectly clear that if these colleges are to do the work which the country demands they must receive pecuniary assistance. They cannot from their very nature be made self-supporting. Their object is to afford a thorough but also a cheap education, and the localities have in almost all cases now practically exhausted the power of raising funds from private sources. How, then, are the necessary means to be found? They must come either from Imperial or from municipal sources. As the Master has pointed out, the remedy must be a speedy one. We cannot afford to wait until public opinion has reached the point at which ratepayers generally are convinced that it is to their advantage to support such colleges. The only alternative, therefore, is that the nation as a whole shall, through the Government, acknowledge its obligation to supply the necessary funds, the amount required being comparatively small and not one likely largely to increase. It is satisfactory to know that the whole subject of the furtherance of scientific and technical education in the country is at the present moment under the serious consideration of Members of Parliament of all political parties, and I have good reason to hope that our efforts to bring this question, vital as it is to the industrial and commercial supremacy of the country, to a satisfactory issue may, even this Session, be crowned by some measure of success. Among the several important matters engaging our attention, I need scarcely say that this particular one, affecting as it does the higher technical education of those who are hereafter to take positions as leaders in our commerce and industries, is by no means the least important."

We trust that the new impetus now given to this question may lead to beneficial results. It is to be hoped, however, that we shall hear less of the word "*technical*" in connection with these colleges, for if they are technical only, we may be better without them.

THE EARTHQUAKE IN SWITZERLAND

PROF. FOREL, the meteorologist, of Morges, on the Lake of Geneva, has just issued a report on the earthquake of February 23. He classifies the shocks under three heads—namely, preparatory shocks, strong shocks, and consecutive shocks. It is difficult, in the absence of trustworthy data, to indicate the precise locality of the first-named, but Switzerland was undoubtedly the region of the second; but it was to the third—that is, the consecutive shocks—that all the mischief was due. The professor traces the course of the phenomenon in Switzerland over a radius of at least four hundred square miles. Its force was greater in the southern parts of the country than in the north, though the shocks were felt throughout Geneva, Berne, Neuchâtel, Fribourg, Vaud, Valais, and Tessin; and observations go to prove that these shocks travelled almost due north and south, although the direction of the oscillations does not coincide with this course. The

oscillations in Switzerland were characterised by their number and repetitions. In some localities they were longitudinal; that is, running parallel to the meridian; in others they were transverse, running or flowing from east to west. The vertical movements were marked by their feebleness where indicated, but in the greater part of the territory affected vertical oscillations were entirely absent. One of the peculiarities of the oscillations generally was the length of duration, which is set down as varying from 10 to 30 seconds. But the collected reports prove that the mean of these figures more nearly represents the prevailing duration. The intensity of the shocks was greater in the central and southern areas of the disturbance, and it would seem as if the shocks only just failed to attain the necessary strength which would have produced disastrous effects. As it was, church bells were rung, in some places violently; windows were rattled, doors thrown open, ceilings slightly cracked, and morsels of plaster were brought down, and here and there stacks of wood were thrown over. One of the most striking features of the phenomenon was the extraordinarily large number of clocks that were instantly stopped, and this fact has afforded the best possible means of determining with something like perfect accuracy the time of the shocks, which varies from three to four minutes past six in the morning, Berne time. The large astronomical clock of the Observatory at Basle stopped exactly at 6h. 4m. 7s. This, taken as representing Berne time, corresponds with 5h. 43m. 35s. of Paris, 5h. 55m. 43s. of Marseilles, 6h. 3m. 2s. of Nice, and 6h. 24m. 3s. of Rome.

The consecutive shocks, which were responsible for all the loss of life and damage to property, were centralised in the region of the Riviera. The greatest damage was done by the two first shocks, which occurred with an interval of fifteen minutes between them. The reports from the Swiss observatories also show that a series of feebler shocks were experienced in Switzerland later on in the same day, and also on several succeeding days.

NOTES

SEVERAL schools of science and art in the colonies and dependencies of the United Kingdom have expressed a wish to be allied with the Department of Science and Art and to have the advantage of its examinations. It has therefore been decided that upon the application of the Colonial Government or Educational Department, or other public authority of the colony, the Department of Science and Art will arrange for the examination of their schools, on the results of which examination certificates and returns of awards will be issued. The entire cost of the examination of the papers and works, and of their carriage, clearing in London, and conveyance to and from South Kensington, will, of course, have to be defrayed by the local authority concerned. The personal examinations, the subjects of which are stated in the Science and Art Directory, must be held in the colonies and dependencies upon the earliest date possible after the receipt of the examination papers, and these examinations must be conducted by qualified and responsible persons not immediately interested in the results of the examinations, who should on the conclusion of each examination furnish a certificate that the examination has been fairly conducted. The examination of works is held at South Kensington, and works to be examined must be forwarded to reach South Kensington not later than the end of April in each year. The Department will send upon application copies of lists of examples and prizes, and will, as far as possible, advise the local authorities in reference to the conduct of science and art schools or classes. The Department will also present specimen examination papers or works—when there are such in stock disposable—with the view of indicating the style of drawings

and paintings done by students and candidates in the United Kingdom, and the standards of attainment for the various examinations.

CAPT. A. W. GREELY has been appointed to succeed the late General Hazen, as Chief Officer of the Signal Service in the United States, with rank of Brigadier-General. This announcement has been well received in America even by those who have hitherto wished to see the Signal Service separated from the army. Capt. Greely was next in rank to General Hazen in the bureau, and his eminent fitness for the duties of his new position is universally acknowledged.

THE Paris Geographical Society will shortly celebrate the centenary of the La Péronse expedition round the world. The last news received from the unfortunate explorer and his companions was brought to France by an uncle of M. de Lesseps.

SEVERAL interesting speeches were delivered in the House of Commons, on Monday evening last, in connection with the supplementary vote of 10,560*l.* for the Science and Art Department. Mr. Mundella said the vote asked for was the result of an automatic increase in which every member who had spoken ought to rejoice. The increase had been large and rapid. In 1875 the total number of pupils in every branch of art instruction was 444,000, while in 1885 the number had increased to 883,000, or nearly double. There had been a large increase of art schools, where, he thought it would be admitted, the work was much better done than in art classes. He did not, however, profess to be satisfied with the position we have attained. It was true, he said, our Estimates were large as compared with twenty-five or thirty years ago; but, as compared with other countries similarly situated to ourselves, they were a disgrace to us. The expenditure on education in England was 5 per cent. of the whole expenditure of the country, but in some other countries the expenditure on education formed one-third of the whole expenditure of those countries—in Switzerland, for instance, it was rather more than one-third. While it was the duty of the Treasury to keep down expenditure, there would be no real good done in this country until the expenditure on education was largely increased. Prof. Stuart also insisted that England does not yet do nearly enough for scientific education. To illustrate this, he quoted the school statistics of New Zealand and Australia, showing the large proportion of children attending science teaching in those colonies. Prof. Stuart argued strongly in favour of technical instruction being carried on in evening classes, so that the minds of workmen might be concentrated on those branches of work which they might not so easily acquire in the workshop. An immense impulse had been given in the right direction when the examination in chemistry had been made one of a practical kind, instead of merely book-work and paper-work, and a similar step would have a good effect in the case of physics and mechanics. In conclusion, Prof. Stuart urged upon the Government the desirability of extending as far as possible the scholarships, local exhibitions, and prizes in connection with the science classes. Sir H. Roscoe gave it as his opinion that the money which the country voted for the purpose of science and art instruction was money well spent. The importance of the question could not be overrated, and the Science and Art Department was in a position to carry out in the main the requirements of the country in regard to such instruction. There was, however, one matter to which the Department had not yet given attention, and that was the question of manual instruction in the use of tools. In view of what was being done on the Continent in extending science and technical instruction, he trusted the Committee would pass the vote as only the beginning of what they might hope to get in time.

WE regret to announce the death of Dr. August Wilhelm Eichler, Professor of Botany at the Berlin University, and Director of the Royal Botanical Garden and Botanical Museum at Berlin. He died on Wednesday, the 2nd inst.

DURING the past month there have been several fine displays of the aurora borealis in Northern Sweden. The displays generally began about 8 o'clock p.m., and continued till towards midnight, the point of culmination being reached about 11 o'clock. The aurora appeared in the form both of streamers and clouds, the colours being mostly white and yellow.

ON February 19, about midnight, a brilliant meteor was seen in Central Norway. It went in a direction north-east to south-west, and was observable for several seconds. The colour was at first brilliantly white, but changed during the passage into yellow and green. The greatest apparent size of the meteor was equal to that of the full moon. It left a trail a couple of yards in length, portions of which remained for some seconds after the meteor had been lost to view behind a mountain ridge. During its passage it lit up the country within a great area.

THIS year Prof. Du Bois-Reymond will celebrate the twentieth anniversary of his appointment as secretary of the Academy of Sciences of Berlin. He is the oldest member of the physico-mathematical class of the Academy.

IN a lecture delivered at the Society of Arts on Wednesday, the 2nd inst., Mr. E. J. Beale stated that last season's experiments in the cultivation of tobacco in England and Ireland resulted in a success satisfactory beyond the hopes of the most sanguine promoters of the experiments. While reasonable caution in the matter of area and extent of future operations was necessary, those results, he thought, more than justified further trials.

THE fifty-fifth annual meeting of the British Medical Association will be held at Dublin on Tuesday, August 2, and the three following days. Dr. Withers Moore, Senior Physician to the Sussex County Hospital, is President, the President-Elect being Dr. John T. Banks, Regius Professor of Physic in the University of Dublin. An address in Medicine will be delivered by Dr. W. T. Gairdner, Professor of Medicine in the University of Glasgow; one in Surgery by Dr. E. Hamilton, Fellow and Professor of Surgery in the Royal College of Surgeons in Ireland; and one in Public Medicine by the Rev. S. Haughton, M.D., Senior Fellow of Trinity College, Dublin. The scientific business will be conducted in eight sections and two sub-sections. Dr. G. F. Duffey, of 30 Fitzwilliam Place, Dublin, is local Honorary Secretary.

THE Exhibition of Marine Meteorological Instruments organised by the Royal Meteorological Society, which will be held at the Institution of Civil Engineers, 25 Great George Street, Westminster, from Tuesday to Friday next, the 15th to 18th inst., promises to be very interesting and instructive. Many of the instruments used in the *Challenger* and other expeditions will be exhibited. At the meeting of the Society on Wednesday evening, Dr. H. R. Mill will read a paper on "Marine Temperature Observations." Any persons, not Fellows, wishing to visit the Exhibition or to attend the meeting, can obtain tickets on application to the Assistant Secretary, Mr. W. Marriott, 30 Great George Street, S.W.

IN the State of New York there are at least fourteen distinct laws relating to the medical profession. The State Legislature is now considering a measure for the entire repeal of some of these laws, and for the abrogation of parts of others. Science is of opinion that the measure "should meet with the hearty support of the medical profession, and receive the vote of every member of the Legislature."

MESSRS. CASSELL AND CO. will have ready, shortly, "A Manual of Practical Solid Geometry, adapted to the Requirements of Military Students and Draughtsmen," compiled by Major William Gordon Ross, R.E., Professor of Geometrical Drawing and Fortification, Royal Military Academy, Woolwich.

MESSRS. GRIFFIN will publish, shortly, a work on pathology, by Prof. Julius Dreschfeld, of Owens College.

DR. THOMAS JONES, Lecturer on Surgery at Owens College, has a work on surgery in preparation. Messrs. Smith, Elder, and Co., will be the publishers.

MR. H. K. LEWIS will issue immediately "Photography of Bacteria," illustrated with eighty-six photographs reproduced in autotype, by Dr. Edgar M. Crookshank; also a second edition, revised and considerably enlarged, of "Manual of Bacteriology," by the same author.

WE have received the first number of the *Wesley Naturalist*, a monthly journal of the new Wesley Scientific Society, of which the Rev. Dr. Dallinger, F.R.S., is President. In an introductory paper, Dr. Dallinger says the Society does not hope to do important original work. Its aim will be "to direct, stimulate, and help, mostly the young and those engaged in daily work, in acquiring correct knowledge of the principles of a chosen branch of science."

MESSRS. GURNEY AND JACKSON, the successors to Mr. Van Voorst, are about to publish a List of British Birds, which has been revised by Mr. Howard Saunders. It will be printed so as to be available for the labelling of specimens. The use of varied type will enable the student to distinguish readily the rarer visitors and the species having a doubtful claim to be considered British.

AN extensive fish-culture establishment is being formed by Mr. William Burgess on his estate at Malvern Wells, Worcester, for the propagation of Salmonidæ and coarse fish. A series of breeding- and rearing-ponds has been made, and a hatchery capable of incubating four millions of ova is being constructed. The site selected for the purpose is said to be admirably adapted for fish-culture, as there is an abundance of pure water. Mr. Burgess has already turned into his waters a quantity of fish, including trout, salmon, and carp.

IN the spring the U.S. Fish Commission steamer *Albatross* will sail for her work on the Pacific. The fish-bearing properties of the Kiu Sawa, or Black Stream of Japan, will be investigated. The Kiu Sawa, crossing the Pacific in a high latitude, is said to modify the temperature and climate of Alaska and the Aleutian Archipelago in very much the same way as the Gulf Stream modifies the climate of the British Isles.

THE managers of the Royal Victoria Hall and Coffee Tavern show much discretion in the choice of subjects for their well-known "Penny Science Lectures." On Tuesday last a lecture on "Vesuvius and Ischia, a Volcano and an Earthquake," was delivered by the Rev. W. W. Edwards. On Tuesday next, Prof. George Forbes will describe "A Journey across Asia, through Siberia," and, on the 22nd inst., the Dean of Westminster will lecture on "Westminster Abbey."

A REPORT of the proceedings of the thirty-fifth meeting of the American Association for the Advancement of Science, held at Buffalo in August last, has lately been published. It contains, besides many short papers and abstracts, the address of Mr. H. A. Newton, the retiring President, and the addresses of the Vice-Presidents in the Sections of Mathematics and Astronomy, Physics, Chemistry, Mechanical Science and Engineering, Geology and Geography, Biology, Anthropology, and Economic Science and Statistics.

IN the second Bulletin of Miscellaneous Information, issued from the Royal Gardens, Kew, there is an interesting account of Cape boxwood. Some time ago a sample of the wood of this tree was sent to Kew, and it was found that the two woods were almost identical. It was clear, therefore, that Cape boxwood was none other than a species of *Buxus*, and perhaps *B. sempervirens* itself. Small samples were exhibited in the Cape Court at the recent Colonial and Indian Exhibition, and in the Catalogue it was stated that the wood had been "very favourably reported on for engraving purposes." The general appearance of the specimens at the Exhibition did not recommend Cape boxwood to the notice of engravers.

WE regret to announce the death of Dr. Birnbaum, Professor of Chemistry at the Technical High School at Karlsruhe, on February 20; and of Dr. Reinhold von Reichenbach, the well-known chemist, who died at Gratz on February 23.

THE South American Exhibition at Berlin has resulted in a great pecuniary loss.

M. E. BERILION has just published a little book on Paul Bert's scientific career. Being a medical man himself, he has been able to give a very clear and accurate idea of M. Bert's work in physiology.

AT a recent meeting of the Paris Biological Society an apparatus was shown, made of iron and glass, in which a pressure of 1000 atmospheres can be developed for the purpose of studying the influence of pressure on animal life.

THE third meeting of the French Congrès de Chirurgie will take place in Paris in the month of April 1888. The second one was held in November 1886. Prof. Verneuil is President-Elect for 1888.

THE earthquake which took place on February 6 in Southern Indiana, Illinois, a small portion of Kentucky, and East Central Missouri is said by American newspapers to have had an area of about 75,000 square miles. The greatest intensity was in South-Western Indiana and South-Eastern Illinois. The U.S. Geological Survey is trying to obtain accurate information as to the boundary of the area covered.

CORRESPONDENTS in Athens report that on Friday last successive slight shocks of earthquake were felt from noon to midnight at Philiatra. The direction was south-west by south.

M. FLORAN DE VILLEPIGNE has devised, in Paris, an instrument, the autographometer, which records automatically the topography and difference of level of all places over which it passes. It is carried about on a light vehicle, and those who wish to use it have nothing to do but to drag it, or have it dragged, over the ground of which they desire to obtain a plan.

THE University of Berlin is being attended, during the present term, by no fewer than 5357 students. This is the largest number of students that have ever been enrolled by a German University. In the Faculty of Philosophy there are 1984 students; in that of Medicine, 1297; in that of Law, 1282; in that of Theology, 794. The number of instructors is 288, of whom 147 are in Philosophy, 103 in Medicine, 22 in Law, and 16 in Theology.

THE Chicago Manual Training School has lately issued its fourth annual Catalogue. The requisites for admission to this institution are that the candidates be at least fourteen years of age, and be able to pass a satisfactory examination in reading, spelling, writing, English composition, geography, and arithmetic. The course extends over three years, and includes instruction in mathematics, science, language, drawing, and shop-work, during the entire period. The school has a well-equipped wood-room, foundry, forge-room, and machine-shop,

and ample apparatus for teaching the various subjects in which instruction is given. Although the regular school exercises were begun only in February 1884, the total number of pupils enrolled is now 190.

In his Report for 1886, Mr. Andrew S. Draper, Superintendent of Public Instruction in the State of New York, points out that that State is now spending 14,000,000 dollars annually in support of its public school system; and he suggests that it might be well to spend a few thousands occasionally in efforts to determine the best way of using this vast sum. Mr. Draper puts some questions which show that he is far from being perfectly satisfied with the educational system he has to administer. "Is there not," he asks, "too much French, and German, and Latin, and Greek, and too little spelling, and writing, and mental arithmetic, and English grammar, being taught? Have we been as ambitious of progress in the lower grades as in the advanced? Are not our courses of study too complex? Are we not undertaking to do more than we are doing well? Is not the examination business being overdone? Are we not cramming with facts, which will soon be forgotten, rather than instilling principles which will endure?"

In an article in the March number of the *Zoologist*, Mr. Robert Service tries to show that, until near the end of the first quarter of the present century, ptarmigan were natives of the south-west of Scotland. He thinks that when these birds were on the mountains of Dumfriesshire and Galloway they were probably also to be found on the Cumbrian Mountains. Mr. Service says that, in nearly all the outlying stations of the present race of ptarmigan in Scotland, such as Arran, Argyll, and the Outer Hebrides, they are decreasing.

MR. WILLIAM BURGESS, who owns an extensive pheasantry at Malvern Wells, has recently made some observations upon the red worm, which is one of the worst assailants of birds. He thinks it comes from the droppings of cattle, which when young are especially liable to the attacks of this insect. Mr. Burgess finds that agricultural salt acts as a remedy against it.

A DISCOVERY of great geological interest was lately made on Juckatoo Island, Sydney, in the shape of a Mastodonsaurus. There is a similar specimen from Stuttgart in the collection of the University, but this one is remarkable from the fact that it is the first Labyrinthodont found in Australia. It belongs to the Triassic age of the Hawkesbury Sandstone formation.

DR. WEILL, of Paris, having carefully studied the new therapeutical agent, antifebrine, or acetanilide, discovered by Cohn and Hepp, of Strasburg, says that it is an anæsthetic agent, and that it combats fever very effectually.

A FRENCH translation of the "Phantasms of the Living" is being prepared in Paris by M. Ch. Richet and some other persons.

M. HAYEZ, of Brussels, has issued a second edition of "A General List of Observatories and Astronomers, and of Astronomical Societies and Reviews," prepared by M. A. Lancaster, Librarian of the Royal Observatory of Brussels. The List has been drawn up with great care, and, from the fact that a second edition has been called for, we may assume that astronomers have found it of considerable service. The names and addresses of all well-known astronomers are given, and the compiler has noted every Observatory, whether public or private, in which work is actually being done.

In the Proceedings of the U.S. National Museum, lately issued, there is a paper by Mr. G. H. Boehmer, on Norse naval architecture. Mr. Boehmer gives a clear and remarkably interesting account of the forms of boats represented in the ancient rock-sculptures of Sweden and Norway; of the boat-shaped stone burial-groups supposed to have been erected during

the transition time from the Bronze period to the Iron Age; and of boat-remains dating from the third to about the ninth or tenth century of our era, and found at various times and places. The ship found at Tune, and the Gokstad ship, are carefully described. Mr. Boehmer thinks that the "Northland boats" now used in the fisheries along the coast of Norway are almost exactly like those which have always been used by Norsemen from the time of the rock-sculptures. These Northland boats are described as long, narrow, and low, light and elegant, and fit both for sailing and rowing.

THE additions to the Zoological Society's Gardens during the past week include a Black-winged Kite (*Elanus ceruleus*) from the Cape of Good Hope, presented by Mr. R. Southey; a Hawfinch (*Coccothraustes vulgaris*), British, presented by Mr. W. H. Quintin; two Pike (*Esox lucius*) from British fresh waters, presented respectively by Mr. H. E. Young and Mr. G. C. Sykes; two Gloved Wallabys (*Halmaturus manicatus* ♂ & ♀), two Cereopsis Geese (*Cereopsis nova-hollandiae*) from Australia, a Blossom-headed Parrakeet (*Ptilinopus cyanocephalus*) from India, received in exchange; two Pike (*Esox lucius*) from British fresh waters, purchased.

OUR ASTRONOMICAL COLUMN

SOLAR ACTIVITY IN 1886.—The latter part of 1886 showed a most remarkable falling off in the number and size of the sun-spots, a falling off so great as to lead so experienced an observer as Prof. Tacchini to speak of it as possibly the minimum of the eleven-year period. The following numbers, taken from Prof. Tacchini's tables (*Comptes rendus*, vol. ciii. No. 2, and civ. No. 4), may be compared with those we gave (NATURE, vol. xxxiii. p. 398) for the year 1885:—

	Relative frequency	Relative size of spots	Daily number of spot groups	Relative size of faculæ
January	8.84	60.42	2.00	47.63
February	6.30	29.00	1.70	32.10
March	14.39	84.78	3.87	43.91
April	8.13	51.91	3.00	41.32
May	6.50	52.77	1.92	37.81
June	7.14	25.22	2.32	37.14
July	8.30	39.93	2.17	35.42
August	3.24	18.70	1.40	8.33
September	5.59	23.41	1.45	18.52
October	1.46	8.08	0.69	18.08
November	0.04	0.15	0.04	7.41
December	6.17	27.04	1.22	15.65

After the fine group of spots which were seen on May 7 and 8 had passed out of sight, the spots decreased in number and size pretty steadily until the end of October. From October 31 to December 12 there then ensued a long period of almost total quiescence. On six days only out of the forty-two could there be discovered on the sun any trace even of a spot, and on those days only one tiny spot could be seen. For an entire rotation and a half the sun was practically free from spots. M. Riccò has also drawn attention to this remarkable interval, and on searching the Palermo records for the earliest comparable period after the maximum of 1870, he finds a somewhat similar interval of quiescence in 1875, five years after the maximum of 1870, and nearly eight years after the minimum of 1867. The depression of last November follows the maximum of 1884 by less than three years, but the previous minimum by about eight years; reckoning from the minimum, the November depression follows the precedent of 1875, but reckoning from the maximum, it would appear to have occurred most exceptionally early. It would seem, therefore, that the irregularity has not been so much in the principal or secondary minima as in the maximum of 1884, which fell later than the mean by nearly two years. M. Riccò anticipates that the true minimum of the eleven-year period will fall in 1890.

A striking feature of the past year has been the great diminution, and for some months, the almost total cessation of spot activity in the northern hemisphere of the sun, nearly all the principal groups having been located in the southern hemisphere.

Faculæ and prominences have shown a falling off in 1886, but